Multi Electric Mfg.

A New Approach to Airport Lighting

Eliminating Unnecessary Connections for Series Circuits

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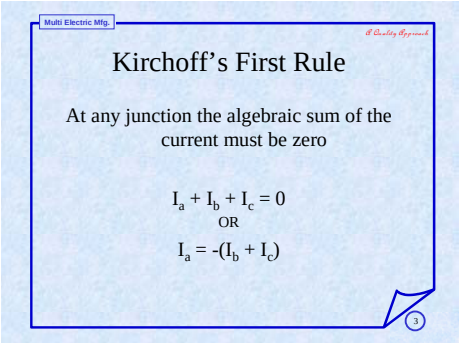
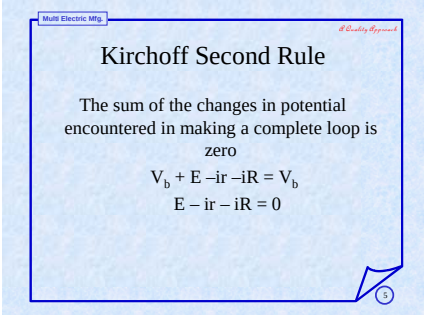
Originally I promised to talk about the innovations in airport lighting. As I thought about all the improvements in the last few years, I realized that this was a greater task then I originally thought. We have moved from the PAR 56 Lamp to the small MR16, gone from incandescent to quarts, and are using HID, fiber optics and LEDs. We have changed the optics of our fixture and reduced the height of the in-pavement fixture from 1 inch to ¼ inch to completely flush based on the improvements in light sources and optics.

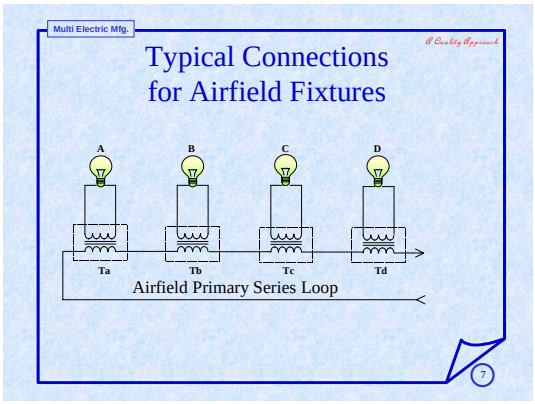
I, therefore, decided to modify my paper to only one short improvement in Airport Lighting. I want to reduce the number of connection in a series circuit. This is only possible if we follow the rule of Kirchoff. The first rule is the sum of the current from any node or connection is zero.



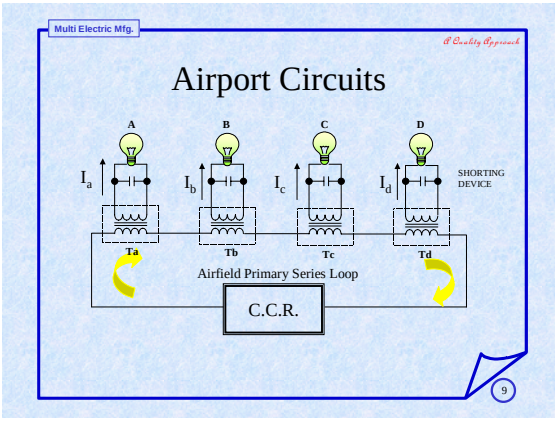
The second rule is the sum of the voltage in a loop is zero



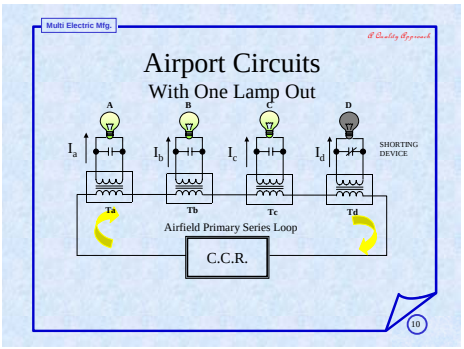
. Under the series circuit, all lights are connected from one lamp to the other.
To eliminate the outage of all lamp if one lamp fails, an isolation transformer is used to connect the individual lamps.

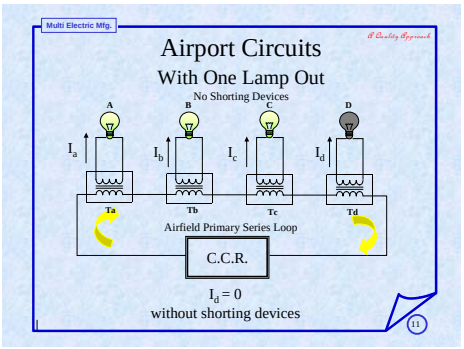


In Airport Lighting, all loads (lamps) are connected with an isolation transformer. In some instants, two lamps are connected across the secondary of the isolation transformer. If one lamp should fail, then both lamps fail unless there is a shorting device across the first lamp. Shorting devices consist of fuses, relays or solid state devices that short when the voltage goes high.

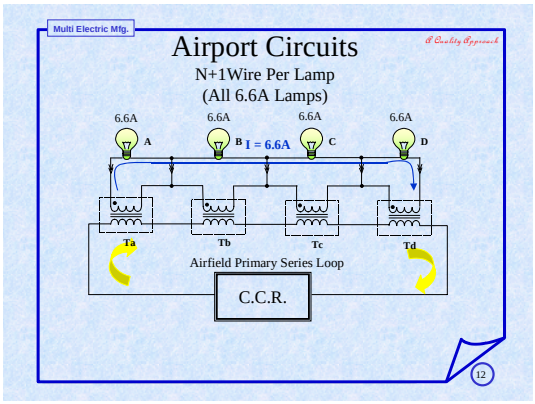


By disconnecting one lamp, the current will continue to flow if a shorting device is used and will be zero if there is no device.

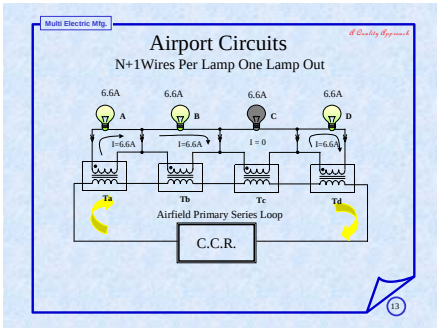


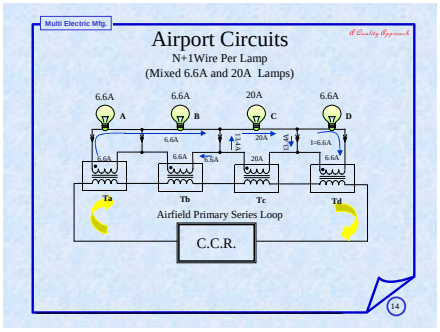


I propose that we can remove wires in the secondary side of the isolation transformers and therefore, reduce the number of wires needed for connecting the lamp loads. If we have a circuit as shown in this drawing.

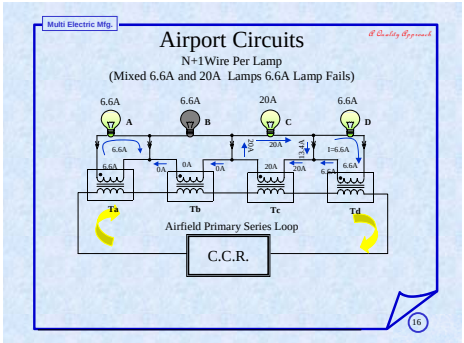


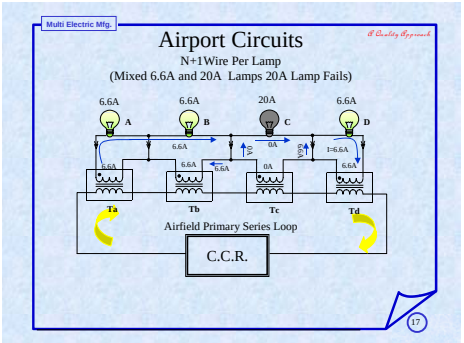
By removing three wires from the above circuit, we can create a continuous circuit that will provide a proper path for the current flow. If a lamp fails, then the current will redirect itself and the circuit will be continuous. The flow of current depends on the path and the availability of the current from the source or the transformer. We can mix and match different current by following Kirchoff's first rule." The first rule is the sum of the current from any node or connection is zero."



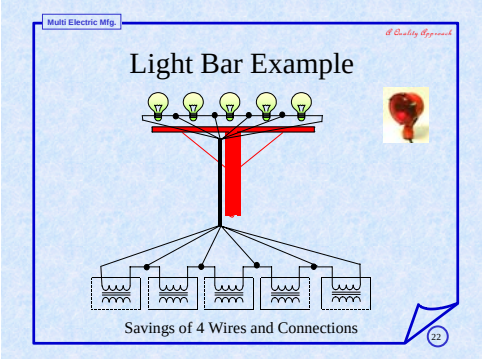


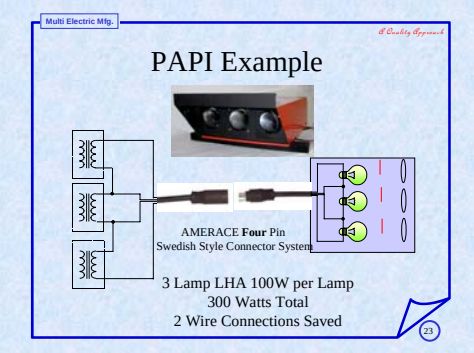
If we mix a 20 amp circuit with the 6.6 amp circuit, we see the currect flow as follows:





Applications of this principal are light bars, PAPI, Wig-Wag, ASMIGS, and multiple lamps in a single fixture.





In conclusion, we can use n plus one for the number of wires necessary to connect n number of lamps.